

**REMARKS**

In paragraphs 1 – 3 of the Office Action, Claims 25 – 35 are now rejected as being anticipated by Lacroix (US5253116).

As stated in the previous Office Action reply, the Blackham inventive aspect has two features as follows:

- (i) The curved projection screen is of such a shape and/or position that portions of the screen vary in distance from the curved collimating mirror whereby image distance is not constant across the total field-of-view of the display apparatus.
- (ii) The shape and/or position of the curved projection screen is maintained during use of the apparatus whereby, during the use, the display apparatus has an apparent image distance which, when viewed via the collimating mirror, appears to vary within the total field-of-view of the display apparatus without a user of the display apparatus having to move relative to the screen.

**US5253116**

The Examiner states in paragraph 2 of the detailed action,

*"Lacroix discloses a method of producing a display apparatus (column 1, lines 29 - 35),"*

Column 1, lines 29 - 35 states ".....there is proposed a collimated viewing device of the projection device type cooperating with an off-axis spherical mirror and a spherical screen located on the focal sphere of the mirror wherein the projection device illuminates the face of the screen that is facing the spherical mirror,....."

This clearly states "....an off-axis spherical mirror and a spherical screen located on the focal sphere of the mirror,...". If an object is placed at the focus of a spherical mirror, or a curved collimating mirror, that is at a distance from the centre of curvature of the spherical mirror equivalent to half the radius of the spherical mirror, the image is formed at or near infinity. US5253116 discloses the spherical screen being situated on the focal sphere of the mirror. Therefore the image of the screen viewed by the observer will be at or near infinity in all directions within the field-of-view of the display. The apparent image distance is consistent across the field-of-view of the display and does not vary within the total field-of-view. This consistency across the display is identified in the summary of the invention by Lacroix.

It is a key feature of the Blackham invention that apparent image distance is not constant across the field-of-view. It is an aim of the invention to vary it.

The Examiner also states in paragraph 2,

*".. causing the screen (13) to be of such a shape and/or position that portions of the screen vary in distance (column 2, lines 59 - 61) from the curved collimating mirror (15) whereby image distance is not constant across the total field-of-view of the display apparatus (column 1, lines 60 - 62)....."*

The screen (13) is indicated in Figure 4, and as previously described in US5253116 is located on the focal sphere of the spherical mirror (15). The spherical screen and the spherical mirror are defined by parts of concentric spheres, Therefore the distance between the screen and the mirror is constant across the field-of-view, Consequently the apparent image distance is constant across the field-of-view, that is at or near infinity. The image distance in US5253116 does not vary but is kept constant, and it is an aim of US5253116 to keep it constant.

The Examiner continues,

*".....maintaining the shape and/or position of the screen (13) whereby during use the display apparatus has an apparent image distance which, when viewed via the collimating mirror (15), appears to vary within the total field-of-view of the display apparatus without the user of the display apparatus having to move relative to the screen (column 2, lines 64 - 67)....."*

Column 2, lines 64-67, states "In Fig. 4 broken lines show the extreme rear position of the viewing device that has tilted about a fictitious horizontal line, perpendicular to the plane of the figure, and is passing through the observation point 10." This describes how the viewing device, the viewing device being the spherical screen, spherical mirror and projector, has been rotated about an axis passing through 10. The user's eye is indicated by 10 in Figure 4 (column 2, line 39). The viewing device

is therefore rotated about the user's eye. The eye is therefore kept at a constant distance from the spherical mirror and spherical screen. As the relationship between the spherical screen and spherical mirror is constant, the whole viewing device being tilted, the apparent image will remain at or near infinity, and therefore does not vary.

US5253116 also discloses moving the viewing device, in order to increase the total field-of-view, in a vertical direction, (column 2, lines 69 – column 3, line 1) and also in a horizontal direction by rotation around a vertical axis passing through the user's eye position 10 (column 3, lines 4 - 7). This horizontal movement also keeps the user's eye at a constant distance from the spherical mirror and spherical screen.

Each of these movements, vertical tilting and horizontal rotation, is carried out about axes that pass through the user's eye and is designed to conserve the relationship between the user and the viewing device. These movements are designed to keep the relationship between the user and the viewing device constant and therefore the image distance remains constant, that is at or near infinity.

Also, this makes it very clear that the position of the screen is not maintained during use. US5253116 discloses (column 3, line 8) ".....These two rotations of the entire viewing device may then be servo-linked to motions of the user's head.....".

It is a key aspect of the Blackham invention that the screen is maintained in position with respect to the user during use whereby during use the display apparatus has an apparent image distance which varies with the direction the user is looking. This

variation in image distance is achieved by the optical relationship of the screen and the mirror and is achieved without any movement of the screen relative to the mirror and without any movement of the user relative to the screen or mirror.

In the Blackham invention, variation in apparent image distance is achieved by varying the relationship between the screen and the mirror. If the screen is positioned closer to the mirror, the screen having a radius greater than half that of the mirror, then the apparent image will appear closer than infinity. This will be the case across the field-of-view if the centres of the screen and mirror are coincident. However, if the distance between the screen and the mirror varies across the field-of-view, as would be the case if the centres of the screen and mirror are not coincident, then the apparent image distance will also vary across the field-of-view, the image distance in a particular direction being determined by the distance between the screen and the mirror at that point. Therefore, maintaining the screen in these respective positions, causing the image distance to vary across the field-of-view, will maintain a display having varying image distances, the image distance depending on which direction within the field-of-view of the display the user is looking, the user not having to move relative to the screen.

US523116 does not disclose the Blackham invention. On the contrary, it emphasises a viewing device that has an image distance which is constant across the field-of-view, which image distance is kept constant when the viewing device is moved relative to the user.

With regard to paragraph 5 of the Office Action, the prior art made of record by the Examiner and not relied upon has been carefully considered. This prior art is not believed to affect the allowability of Claims 25 - 26 nor the above submissions.

Accordingly, it is respectfully submitted that this application is in condition for allowance. Early and favorable action is respectfully requested.

If for any reason this RESPONSE is found to be INCOMPLETE, or if at any time it appears that a TELEPHONE CONFERENCE with Counsel would help advance prosecution, please telephone the undersigned or one of his associates, collect in Waltham, Massachusetts, at (781) 890-5678.

Respectfully submitted,



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